species such as *J. roemerianus* may be common in some areas in spite of prevalence by species less tolerant to salt. One of the puzzling issues is why these marshes persist in areas that otherwise might be conducive for establishment of fringe swamp. Generally the environmental conditions of nontidal freshwater marshes cannot be distinguished from those that allow the development of forested wetlands (Figure II-3).

Emphasis will be placed on the marshes in the northern part of Currituck Sound for several reasons: (1) much of the freshwater nontidal marsh in the state occurs there, (2) Currituck has had a long history of water quality problems, and (3) the region is undergoing rapid development and land use changes that warrant attention if its wetland resources are to be protected.

These areas are similar hydrologically to nontidal brackish marshes. No information could be found on the depth and composition of sediments underlying the marshes, although Sincock (1966) reported extensive analyses for sediments in open-water areas. Salinities vary, but tend to remain below about 2-3 ppt except in the southern portion of Currituck Sound where freshwater vegetation is more restricted in abundance. Historically, salinity has periodically increased due to the intrusions of seawater through 8 major and numerous smaller breaks in the barrier island during storms. The highest recorded salinity in Currituck Sound was about 33 ppt (Sincock 1966).

The species richness of these marshes tends to be higher than for brackish marshes. Common species reported for northern Currituck Sound are: *Typha ormal* spp. (cattails), *Sagittaria* spp. (arrowheads), *Scirpus olneyi* (olneyi three square), *Kosteletzkya virginica* (seashore mallow), *Polygonum* spp. (smartweeds), *D. spicata* (salt grass), *Scirpus americanus* (chair-maker's rush), and *J. roemerianus* (black needlerush) (U.S. Department of Interior 1980). Additional species may include *S. patens* (salt-meadow cordgrass), *Eleocharis* sp. (spikerush), *Erianthus giganteus* (sugarcane plumegrass), *Hydrocotyle umbellata* (pennywort), and *Panicum virgatum* (switchgrass) (Data provided by Refuge Manager, Mackay Island National Wildlife Refuge 1989).

The nontidal fresh marsh ecosystem probably functions much like nontidal brackish marsh, but modified by the extent to which salinity has an effect on the variables being considered. For example, evapotranspiration might be higher than in brackish marshes because of less osmotic stress required for water uptake.

Fish habitat utilization of the marshes is largely unknown. Young fish are likely to find both cover and food in abundance. Much of the attraction to the region depends on waterfowl hunting and bass fishing. Currituck Sound obviously represents good habitat for these organisms, but the functional relationship of the fresh marshes to other components of the larger estuarine ecosystem has not been well established.

It is difficult to distinguish the boundary conditions between freshwater and brackish water nontidal marshes. Wilson (1962) lists most of the nontidal freshwater marshes in Beaufort, Hyde, Dare, Camden, and Currituck Counties (Table II-2). Nearly half of the coverage appears to be in Currituck County alone.

The Draft Environmental Impact Statement (EIS) prepared for the National Wildlife Refuge on the Currituck Outer Banks (U.S. Department of Interior 1980) describes a transition near Monkey Island between the freshwater marsh to the north and the brackish marsh to the south. Sincock (1966) contains maps of the Back Bay and Currituck Sound depicting dominant marsh types during 1958-64. Most of the aforementioned species occurred north of Monkey Island, while *Juncus roemerianus, Spartina cynosuroides*, and *Cladium jamaicense* were prevalent to the south. For the